CALIFORNIA DEPARTMENT OF WATER RESOURCES

NEWS FOR IMMEDIATE RELEASE

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NASA Report: San Joaquin Valley Land Continues to Sink

Groundwater Pumping Causes Subsidence, Damages Water Infrastructure

SACRAMENTO – New NASA radar satellite maps prepared for the California Department of Water Resources (DWR) show that land continues to sink rapidly in certain areas of the San Joaquin Valley, putting state and federal aqueducts and flood control structures at risk of damage.

"The rates of San Joaquin Valley subsidence documented since 2014 by NASA are troubling and unsustainable," said DWR Director William Croyle. "Subsidence has long plagued certain regions of California. But the current rates jeopardize infrastructure serving millions of people. Groundwater pumping now puts at risk the very system that brings water to the San Joaquin Valley. The situation is untenable."

A prior August 2015 NASA report prepared for DWR documented record rates of subsidence in the San Joaquin Valley, particularly near Chowchilla and Corcoran, as farmers pumped groundwater in the midst of historic drought. The report released today shows that two main subsidence bowls covering hundreds of square miles grew wider and deeper between spring 2015 and fall 2016. Subsidence also intensified at a third area, near Tranquillity in Fresno County, where the land surface has settled up to 20 inches in an area that extends seven miles.

Additional aircraft-based NASA radar mapping was focused on the California Aqueduct, the main artery of the State Water Project, which supplies 25 million Californians and nearly 1 million acres of farmland. The report shows that subsidence caused by groundwater pumping near Avenal in Kings County has caused the Aqueduct to drop more than two feet. As a result of the sinking, the Aqueduct at this stretch can carry a flow of only 6,650 cubic feet per second (cfs) – 20 percent less than its design capacity of 8,350 cfs. To avoid overtopping the concrete banks of the Aqueduct in those sections that have sunk due to subsidence, water project operators must reduce flows.

The California Department of Water Resources (DWR), which operates the State Water Project, is analyzing whether the subsidence-created dip in the Aqueduct will affect deliveries to Kern County and Southern California water districts. If the State Water Project allocation is 85 percent or greater, delivery may be impaired this year due to the cumulative impacts of subsidence in the Avenal-Kettleman City area.

The NASA analysis also found subsidence of up to 22 inches along the Delta-Mendota Canal, a major artery of the Central Valley Project (CVP), operated by the U.S. Bureau of Reclamation. The CVP supplies water to approximately three million acres of farmland and more than two million Californians.

Also of concern is the Eastside Bypass, a system designed to carry flood flow off the San Joaquin River in Fresno County. The Bypass runs through an area of subsidence where the land surface has fallen between 16

inches and 20 inches since May 2015 – on top of several feet of subsidence measured between 2008 and 2012. DWR is working with local water districts to analyze whether surface deformation may interfere with flood-fighting efforts, particularly as a heavy Sierra snowpack melts this spring. A five-mile reach of the Eastside Bypass was raised in 2000 because of subsidence, and DWR estimates that it may cost in the range of $250 million to acquire flowage easements and levee improvements to restore the design capacity of the subsided area.

There are thousands of groundwater wells near state infrastructure that could be contributing to the subsidence recorded by NASA.

In response to the new findings, and as part of an ongoing effort to respond to the effects of California's historic drought, state officials said they will investigate any legal options available to protect state infrastructure. DWR also will investigate measures for reducing subsidence risk to infrastructure, including groundwater pumping curtailment, creation of groundwater management zones near critical infrastructure, and county ordinance requirements.

DWR is conducting its own study of the effects of subsidence along the 444-mile-long California Aqueduct and other State Water Project features and in coming months will identify potential actions to remediate damage. A comprehensive rehabilitation to restore the full California Aqueduct to its original design capacity would likely cost in the hundreds of millions of dollars. A focused triage to address conveyance losses in the most affected portions of the canal may cost tens of millions of dollars per location.

In addition, DWR will work with local water managers to identify specific actions to reduce long-term subsidence risk and consider whether to incorporate further emphasis on reduction of subsidence risk into the ongoing implementation of the Sustainable Groundwater Management Act (SGMA).

An historic package of laws enacted by the Governor in September 2014, SGMA requires local governments to form sustainable groundwater agencies that will regulate pumping and recharge to better manage groundwater supplies. The Act requires groundwater-dependent regions to halt overdraft and bring basins into sustainable levels of pumping and recharge by the early 2040s. Groundwater supplies between 30 percent and 60 percent of the water Californians use in any year. Bringing basins into balance will eliminate the worst effects of overpumping, including subsidence and the dewatering of streams.

San Joaquin Valley land subsidence due to groundwater extraction was observed as early as the 1920s. The most extensive monitoring and research related to subsidence in the Valley was carried out in the 1950s through the 1970s because of concerns about subsidence-related damage to the state and federal water projects. The SWP's 444-mile-long California Aqueduct was designed to take into account subsidence risk. Since the 1960s, subsidence has required repairs such as the raising of canal linings, bridges, and water control structures on the Aqueduct and on the CVP's Delta-Mendota and Friant-Kern canals.

Besides aqueducts, the increased subsidence rates have the potential to damage levees, bridges, and roads.

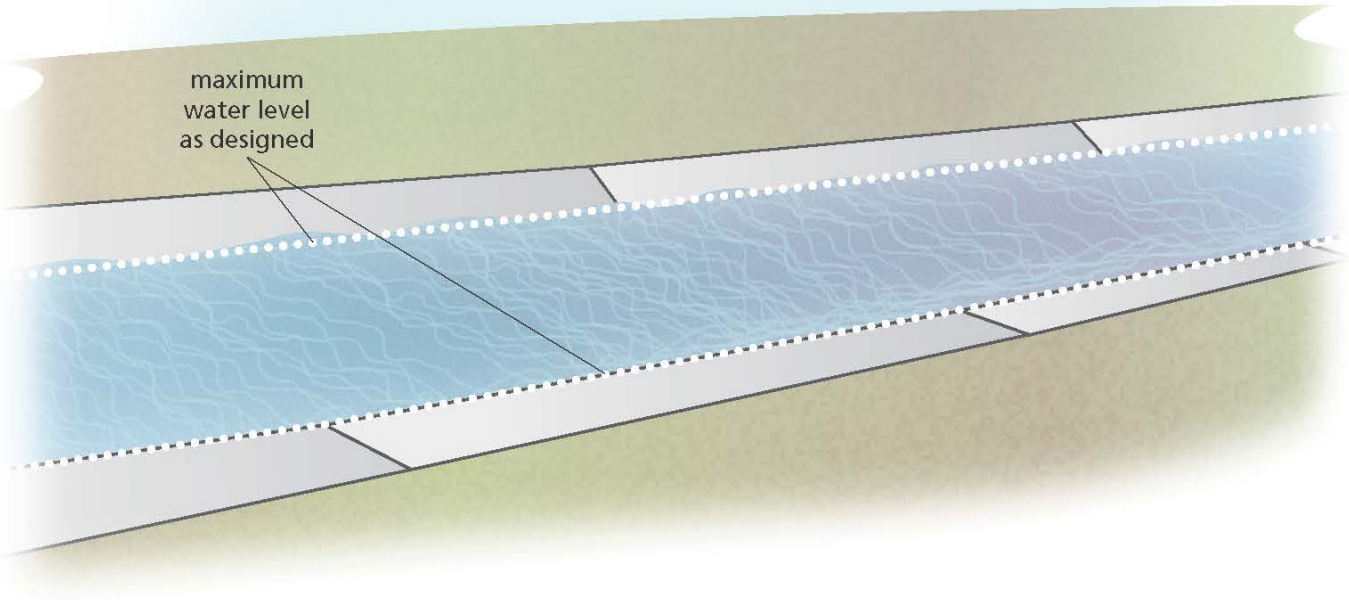
Long-term subsidence already has destroyed thousands of public and private groundwater well casings in the San Joaquin Valley. Over time, subsidence can permanently reduce the underground aquifer's water storage capacity.

There has been no comprehensive estimation of damage costs associated with subsidence. Due to the gradual nature of the impacts, costs will often be covered as part of normal operations and maintenance. Subsidence-related repairs have cost the SWP and CVP an estimated $100 million since the 1960s.

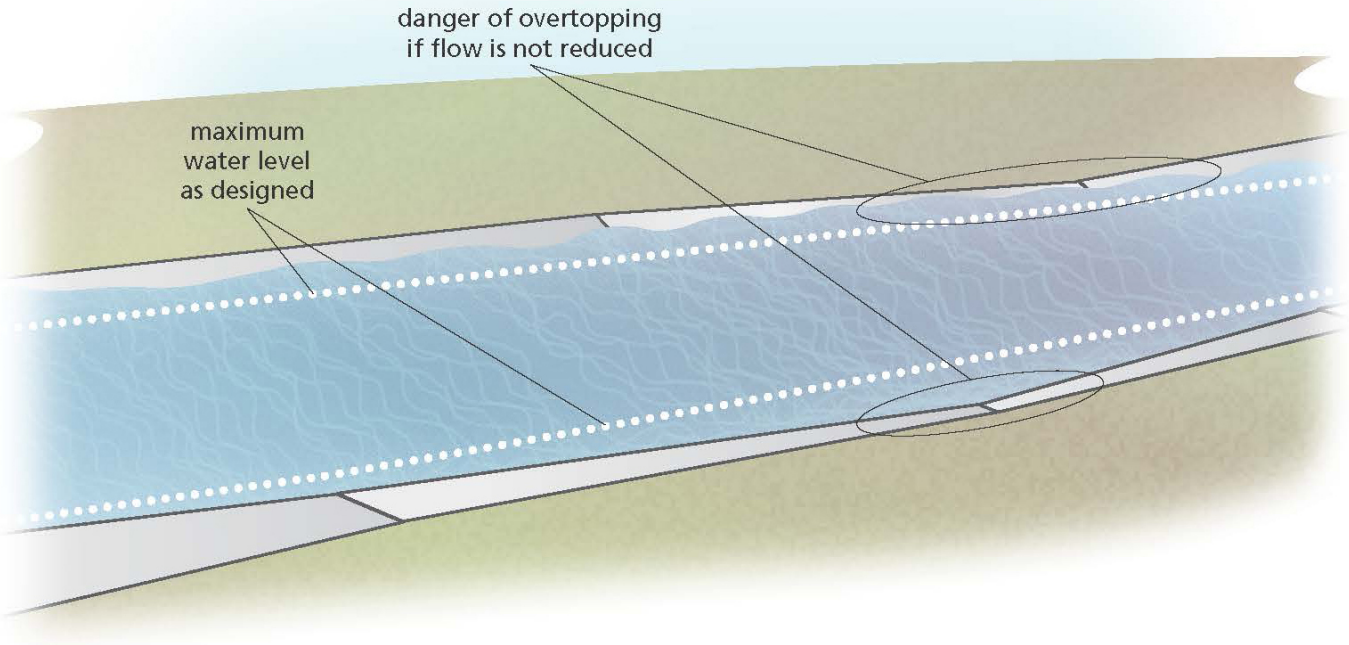
Read NASA's latest report, "Subsidence in California, March 2015-September 2016."

Aqueduct before and after subsidence

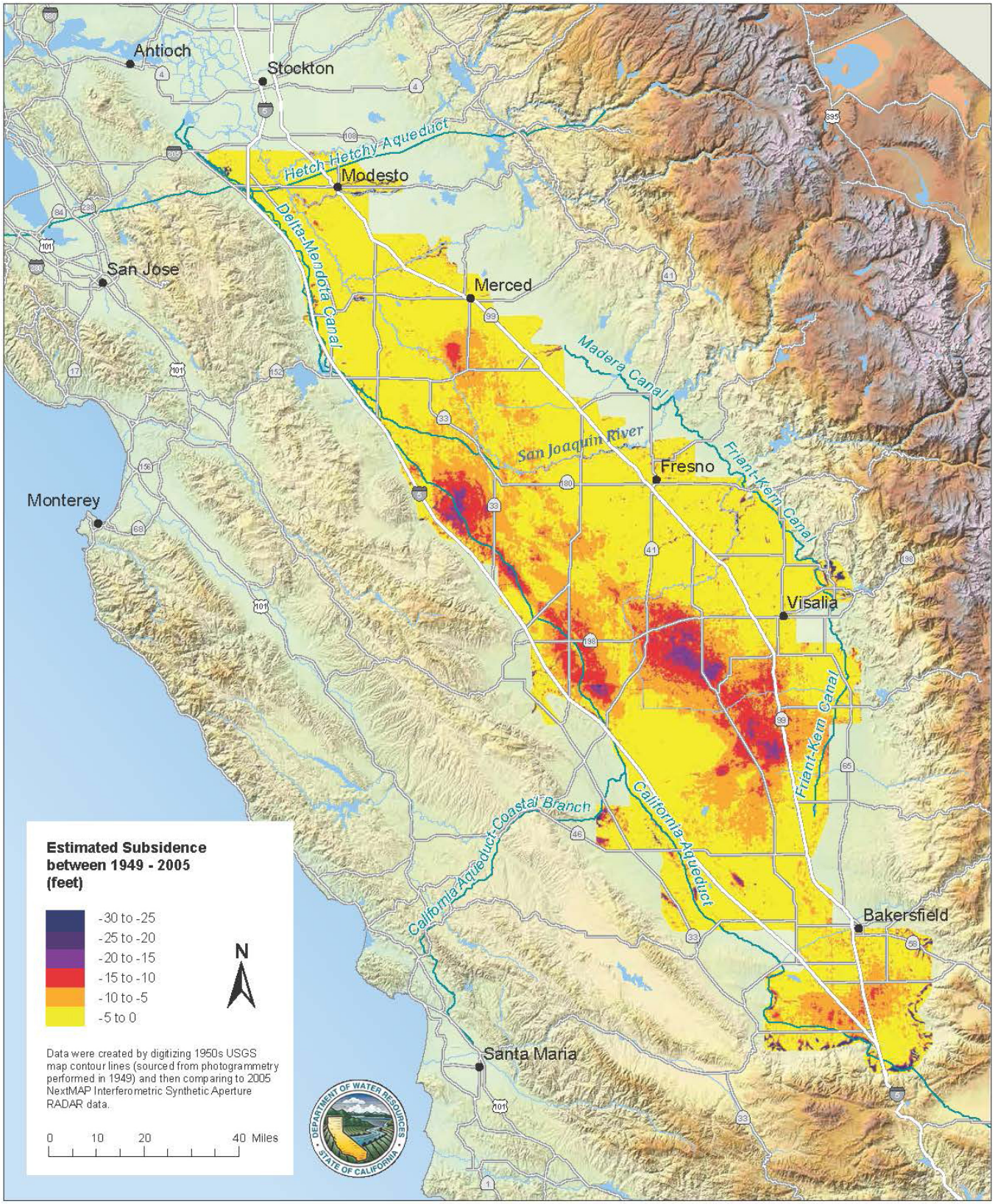
Aqueduct Before Subsidence:



Aqueduct After Subsidence:



Estimated Subsidence in the San Joaquin Valley between 1949 – 2005



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West Washington Road where it crosses the Eastside Bypass, a constructed floodway for the San Joaquin River.

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